City of Long Beach Climate Action and Adaptation Plan
GHG Emissions Reduction Target Options Memo

This memorandum (memo) presents options and considerations for establishing 2030 and 2040 GHG targets and a 2050 aspirational target in the City's Climate Action and Adaptation Plan (CAAP). The options are informed by State guidance on the topic, science-based guidance, the City's aspirations and priorities, and targets adopted by other local governments in the area.

Establishing local greenhouse gas (GHG) emissions targets can be used to:

- Comply with requirements of the Global Covenant of Mayors, to which the City of Long of Beach has been a signatory since 2015
- Demonstrate the City's commitment to global efforts on climate change,
- Illustrate the relationship between the City's reduction target and the State's own reduction goals,
- Provide a goal post against which to evaluate the cumulative progress of the City's GHG reduction actions over time, and
- Demonstrate a level of GHG emissions below which the City would have less than cumulatively considerable GHG impacts.[1]

We have prepared this memo so that portions of the first section can be included in the CAAP document (with minor narrative revisions), and the second, more technical section can be potentially included as a Target-Setting Considerations Appendix to the CAAP in support of the environmental review analysis.

Section 1 – GHG Target Considerations and Options

A. Introduction

In 2017, the City of Long Beach began development of a Climate Action and Adaptation Plan (CAAP). The CAAP aims to reduce communitywide GHG emissions, and help the city adapt to future climate change impacts. As a first step, the City conducted a communitywide GHG inventory to identify its baseline emissions footprint, and is developing business-as-usual forecasts of emissions based on anticipated growth in population, employment, housing, and other factors in the community. In the next stages of the project, the City will establish GHG reduction targets and define local actions to achieve those targets.

While there will be fiscal, economic, and public health benefits, one of the CAAP's primary purposes is to reduce GHG emissions. GHG targets serve as aspirational metrics to help focus local actions to achieve that end. Establishing clear and attainable targets can also motivate community members and City staff, help guide long-term strategies, and increase transparency and accountability regarding the CAAP's objectives.

There are several questions to consider when defining local GHG targets.

- **What type of targets can be used?**

  Targets can be set based on absolute emissions reductions or to reflect emissions efficiency improvements in the community.

[1] *The City's target, along with reduction strategies necessary to achieve this target will facilitate tiering and streamlining for proposed projects under the provisions of CEQA Guidelines Section 15183.5.*

- **What guidance is available to direct local governments in setting GHG targets?**

  California has established several statewide GHG targets through legislative action that can help to inform local GHG target selection. State agencies, including the California Air Resources Board (ARB) and the Governor's Office of Planning and Research (OPR), have also issued guidance to local governments on this topic. The California Environmental Quality Act (CEQA) Guidelines also provide guidance on target selection for cities that would use their GHG reduction strategy to streamline environmental review for future development projects.

- **What does the climate science say?**

  According to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), targets adopted to reduce GHG emissions are "science-based" if they are consistent with the magnitude of emission reductions required to limit the increase of global temperatures to 2°C above pre-industrial temperatures. This translates to the need to reduce global emissions by at least 80% below 1990 baseline levels by 2050.

- **What is the City's emissions profile?**

  The City's 2015 emissions inventory totals 3.3 million metric tons of carbon dioxide equivalent (MMT CO_2e) with the majority coming from transportation (54%) and building energy use (41%). A communitywide GHG reduction target should take into account the sources of emissions and a city's ability to influence its emission sources.

- **What are the City's aspirations and commitments?**

  The City is a leader in environmental sustainability initiatives, including:

  - In 2015, Mayor Robert Garcia signed the Compact of Mayors (now the Global Covenant of Mayors) to join the world's largest coalition of city governments to address climate change.[2]
  - In 2017, Mayor Garcia joined 406 mayors across the United States in pledging to continue the goals of the Paris Climate Agreement to make sustainable changes to limit global temperature rise to well below 2°C.[3]

  The CAAP is intended to chart a pathway to help the City fulfill these commitments.

- **What timeframe should the targets address?**

  Near- and mid-term targets can be useful in setting the City on a pathway toward more aggressive longer-term targets. The specific target years can be chosen based on California's GHG targets, local planning priorities (such as the City's General Plan), or other considerations.

- **What kind of targets are other local governments in the area using?**

  Long Beach is not acting alone in its efforts to reduce GHG emissions, and the targets of other local governments can also help to inform the City's own target selection process.

B. Target Types

GHG targets can be expressed as either ***mass emissions*** targets or ***efficiency*** targets.

Mass Emissions Targets

Mass emissions targets establish an absolute emissions level to be achieved by a target year, such as 100,000 metric tons of carbon dioxide equivalent per year (MT CO_2e/yr) by 2020. Typically, mass emissions targets are expressed as a percent below the emissions level of some base year, such as 80%

[2] *City of Long Beach Press Release "What is Long Beach doing about Climate Change" (11/10/2015) Available: http://www.longbeach.gov/mayor/news/compact/*

[3] *City of Long Beach Press Release "Long Beach Joins Paris Agreement" (06/02/2017) Available: http://www.longbeach.gov/mayor/news/long-beach-joins-paris-agreement/*

below 1990 emissions by 2050. Mass emissions targets are often used in the context of deep GHG reductions or carbon neutrality, described in detail below.

Deep GHG Reduction Targets

This term refers to the common long-term GHG reduction target set by cities, aiming to reduce emissions to approximately 80% below baseline levels by 2050 in order to limit the global temperature increase to less than 2°C compared to pre-industrial temperatures. Many cities leading the effort on GHG mitigation set this long-term target at the start of their climate planning processes (and since that time, some of these same cities have revised their long-term targets to aim for carbon neutrality, as described below). Sometimes, this type of target is also referred to as a ***climate***-neutral target, as it is intended to neutralize the adverse impacts of climate change. The distinction between a climate-neutral target and a zero carbon or a net zero carbon target is noteworthy. While the term “climate-neutral” may be useful for marketing and communication purposes, and while the actions necessary to achieve this target certainly need to be ambitious, this term should not be confused with a zero carbon or net zero carbon target, which requires bold and systemic changes to core city transportation, buildings, and waste systems at a level beyond deep carbon reductions.

Carbon Neutrality Targets

In describing community GHG emissions, the term 'carbon neutrality' is often used interchangeably with 'zero carbon emissions', and 'net zero carbon emissions'. It is important to clarify and define each of these terms.

Zero Carbon Emissions: In its strictest sense, this term refers to a scenario under which a city completely eliminates all sources of direct GHG emissions associated with its activities. While theoretically possible, this type of target is very challenging to achieve due to the fact that some sources of GHG emissions are near impossible to eliminate. Even if a community were to power its built environment and transportation sectors with 100% renewable energy, some GHG emissions from wastewater treatment, solid waste management, refrigeration, or fire suppression are not currently feasible to eliminate. It is worth noting that based on our review of best practices, no city has yet endeavored to establish a goal to achieve zero carbon emissions in the strictest sense of the definition.

Net Zero Carbon Emissions: This term means that the ***net*** GHG emissions associated with a city are zero. Under this scenario, some residual emissions may be produced by a community each year, but they can be fully balanced by investing in offsetting activities such as generating additional renewable energy and providing it to consumers outside the community, biological carbon sequestration, green procurement strategies, or the purchase of verifiable carbon credits.

Efficiency–Based Emissions Targets

Efficiency thresholds set a target level of emissions per population or per service population (i.e., local residents plus local jobs), such as 2.25 MT CO_2e per service population per year (MT CO_2e/SP/yr) by 2035. Efficiency thresholds demonstrate a community’s ability to grow population and employment, while emissions shrink on a per-unit basis; in effect, a community could be growing more efficiently from an emissions standpoint. In this case, total emissions within a community may increase while still achieving an efficiency target, as long as service population is growing faster than emissions.

Mass emissions and efficiency-based target are both useful to consider when evaluating appropriate emissions reduction targets, and OPR suggests that local governments consider both types in their climate action plans.

Mass or Efficiency-based Activity-Specific Targets

While the types of targets described above focus on GHG emissions as a metric for measurement of progress, leading cities are also adopting goals that focus specifically on the activities causing GHG emissions, such as energy consumption in the building and transportation sectors or solid waste generation. These activity-specific targets can be helpful in communicating the City's GHG goals more clearly and tracking progress within individual activities or sectors. However, they should not be used as a replacement for an overarching communitywide GHG target that covers all sectors and emissions activities because it can be difficult to understand how a specific activity target relates to total communitywide emissions. This can be especially problematic when using a CAP to support CEQA streamlining for future projects where it is difficult to demonstrate how achievement of an activity target results in a less than cumulatively considerable impact to GHG emissions.

Mass Targets Related to Net-Zero Fossil Fuel Consumption or 100% Renewable Energy Use: This type of target focuses on the activity that generates the majority of overall GHG emissions at the community level – fossil fuel combustion for energy generation used in buildings, vehicles, and equipment. Some cities use this target because they believe it is easier to understand than a GHG reduction target, and is therefore more inspirational than a GHG reduction target. Some cities have applied this target strictly to electricity generation or related to a specific sector (like transportation), while others intend it to be used for all fuel sources.

Efficiency-based Activity Targets or Budgets: Using the concept of efficiency-based targets, many cities have applied these targets to key consumption activities in daily urban life to create a "budget", such as reducing per-capita electricity consumption or driving by a certain percent by a future year. These forms of targets can make it easier to communicate the role of individual community members in reducing GHG emissions and achieving targets.

C. Guidance on Local Government Target Setting

Guidance on local government target setting in California is primarily based on three sources: the State's own GHG targets, ARB's Climate Change Scoping Plan (Scoping Plan), and OPR's General Plan Guidelines. Together, these sources help to frame the context for local GHG targets. For climate action plans that are designed to provide CEQA streamlining for future projects, precedent case law is another source of guidance for reduction targets, although this guidance is primarily based on the State's legislative GHG reduction targets.

State GHG Targets

California's statewide GHG targets are defined through adopted legislation (2020 and 2030 target years) and an Executive Order (2050 target year), as shown in Table 1 below.

Table 1
State of California Greenhouse Gas Targets

Target Year	Target	Corresponding Legislation
2020	Return to 1990 GHG levels by 2020	Assembly Bill 32 (AB 32), the California Global Warming Solutions Act of 2006
2030	40% below 1990 levels by 2030	Senate Bill 32 (SB 32), the Global Warming Solutions Act of 2006
2050	80% below 1990 levels by 2050	Executive Order S-3-05 (EO S-3-05) of 2005

The State's 2050 target was based on research published by the IPCC regarding the emissions reductions required of developed countries to stabilize atmospheric carbon dioxide levels at approximately 450 parts per million (ppm) setting an upper limit to global temperature increase to 2° Celsius or less to avoid catastrophic impacts of global climate change.[4]

Some cities have simply adopted the State's exact targets, and others have calculated variations of them to more accurately reflect local demographic and economic conditions. There are four primary considerations when using the State's targets as the basis for local targets:

1. How can 1990 emissions levels be approximated locally?
2. What is the local baseline year?
3. What emissions will be analyzed locally?
4. What degree of influence does the City have over different emissions sources?

Section 2 of this memo provides the supporting calculations to estimate local emissions targets based on the State's GHG targets. Following is a discussion oriented around these four questions related to the direct use of the State's reduction targets.

Approximate 1990 Emissions Levels

The State's GHG targets have been established as mass emissions targets and are often referenced in local government target setting. However, the State's specific targets are each benchmarked to a 1990 GHG inventory, and, for most local governments, it is technically challenging to back-cast an inventory for that year. Guidance in ARB's 2008 Climate Change Scoping Plan identified local governments as "essential partners" in achieving the State's GHG goals, and encouraged adoption of local GHG targets "…that parallel the State's commitment to reduce greenhouse gas emissions by approximately 15% from current levels by 2020." Many local governments followed this guidance for their near-term target as a way to approximate a return to 1990 levels (i.e., the State's GHG target for 2020). This helps to explain why many climate action plans in California have a 2020 target defined as 15% below baseline levels.

Consider the Local Baseline Year

It is worth noting that the original guidance suggesting a 15% reduction below current GHG levels approximates a return to 1990 levels was based on an earlier version of the State's emissions forecasts. Following release of the aforementioned guidance, the 2008 economic recession occurred, resulting in slower emissions growth statewide than previously anticipated. Further, the 15% reduction target value was calculated relative to a 2008 baseline year. For cities with different baseline inventory years, the corresponding 2020 target value would be slightly different. ARB also subsequently revised the statewide 1990 inventory, which altered some of the underlying calculations associated with the 1990 target value. Based on the State's current 1990 inventory (and therefore, its 2020 target emissions level) and the 2015 statewide inventory, statewide emissions reductions of 2.2% below 2015 levels would be required to return to 1990 emissions levels. This value reflects the substantial success of emissions-reduction programs implemented across California since the adoption of AB 32. It also highlights the need to thoughtfully consider the selection of local GHG reduction targets with respect to now outdated guidance for local governments

Figure 1 on the following page shows how the statewide emissions have changed since 1990. Emissions increases are primarily attributed to the transportation and agriculture & forestry sectors while substantial emissions reductions occurred in the imported electricity sector during the same period.

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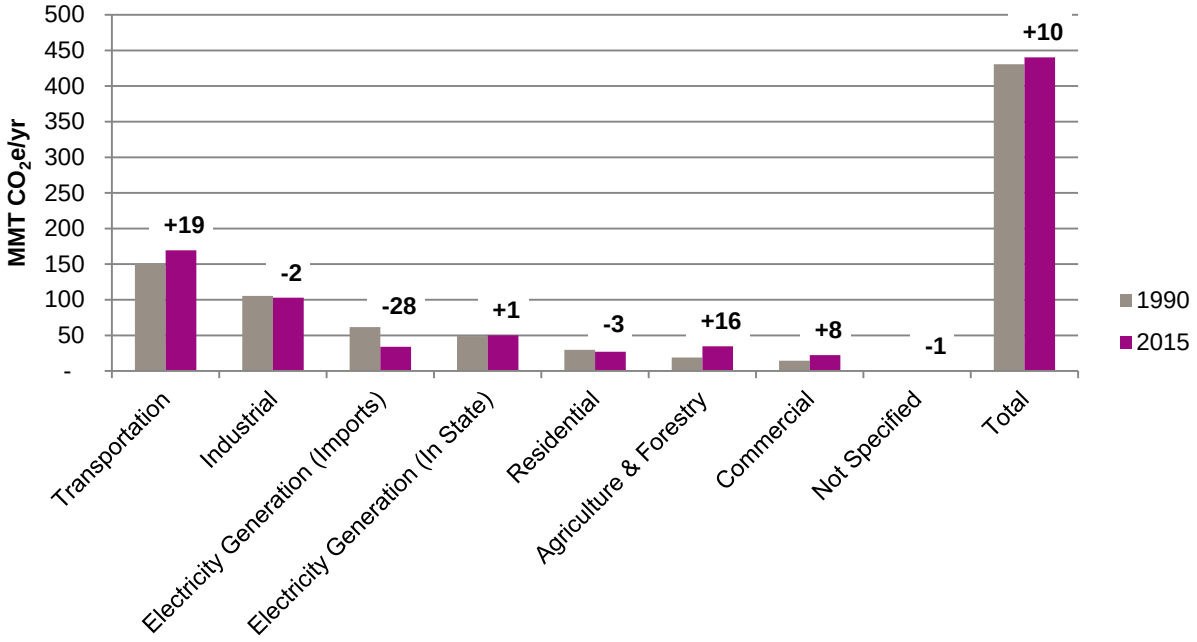
[4] *United Nations International Panel on Climate Change, Fourth Assessment Report: Working Group III, Mitigation of Climate Change, 2007. Available: https://www.ipcc.ch/publications_and_data/ar4/wg3/en/ch13-ens13-3-3-3.html*

Figure 1 – Statewide Emissions Change by Sector[5]



Evaluate Local Emissions Sources

As a final consideration for the State's GHG targets, it is important to understand the sources of emissions included in the statewide inventory and how they differ from the sources typically represented at the community inventory level. Certain emissions sectors are not included or applicable locally, but are included statewide based on the prevailing GHG inventory methodologies. For example, industrial process-related emissions occur within California and are included in the statewide inventory, but these same sources do not occur locally in all jurisdictions and so would not be represented in all communitywide inventories. In addition, some emission sources that may have a local presence are outside the control of local lead agencies – for example, some industrial emissions sources are the purview of the air quality management district, and not the municipality. Therefore, the State's GHG targets should also be customized for use locally in a way that considers the presence or absence of certain emissions sectors and relative degree of municipal influence. This can be achieved by analyzing the sub-set of emissions sectors that will be included in the local GHG inventory. Section 2 presents the results of this customization analysis specific to Long Beach, should the City choose to define local targets based on the State's adopted targets.

Tailoring the reduction target to the specific local context also speaks to the direction from the California Supreme Court's 2015 decision in *Center for Biological Diversity v. California Department of Fish and Wildlife*,[6] commonly referenced as "Newhall Ranch." In Newhall Ranch, the Court indicated that the use of a State legislation-based GHG emissions significance threshold could be acceptable, so long as the

[5] *Figure 1 shows the 1990 and 2015 emissions inventory results organized by economic sector categorization. 1990 inventory available: https://www.arb.ca.gov/cc/inventory/1990level/1990data.htm; 2015 inventory available: https://www.arb.ca.gov/cc/inventory/data/data.htm*

[6] *62 Cal. 4th 204.*

administrative record supports how this threshold is appropriate for a specific project at a specific location.[7] Section 2 provides further detail on tailoring State guidance to local conditions.

ARB Climate Change Scoping Plan – 2008 and 2017

The 2008 Scoping Plan was developed to establish the State's pathway toward achievement of the AB 32 GHG target (i.e., return to 1990 levels by 2020). Within that document, ARB's original guidance to local governments was to adopt a GHG target of 15% reduction below current levels by 2020. Since publication of the 2008 Scoping Plan, SB 32 was adopted (2016) and directed a statewide 2030 GHG target (i.e., 40% below 1990 levels by 2030). ARB subsequently finalized a revised Scoping Plan in November 2017 to establish an achievement pathway for this new 2030 target.

The *2017 Climate Change Scoping Plan* provides the following updated guidance on target-setting for local governments:

> *"Recommended Local Plan-Level Greenhouse Gas Emissions Reduction Goals*
>
> CARB recommends statewide targets of no more than six metric tons CO_2e per capita by 2030 and no more than two metric tons CO_2e per capita by 2050. The statewide per capita targets account for all emissions sectors in the State, statewide population forecasts, and the statewide reductions necessary to achieve the 2030 statewide target under SB 32 and the longer term State emissions reduction goal of 80%below 1990 levels by 2050.
>
> …CARB recommends that local governments evaluate and adopt robust and quantitative locally-appropriate goals that align with the statewide per capita targets and the State's sustainable development objectives and develop plans to achieve the local goals. The statewide per capita goals were developed by applying the percent reductions necessary to reach the 2030 and 2050 climate goals (i.e., 40%and 80%, respectively) to the State's 1990 emissions limit established under AB 32. **Emissions inventories and reduction goals should be expressed in mass emissions, per capita emissions, and service population emissions**. To do this, local governments can start by developing a community-wide GHG emissions target consistent with the accepted protocols as outlined in OPR's General Plan Guidelines Chapter 8: Climate Change. They can then calculate GHG emissions thresholds by applying the percent reductions necessary to reach 2030 and 2050 climate goals (i.e., 40%and 80%, respectively) to their communitywide GHG emissions target. Since the statewide per capita targets are based on the statewide GHG emissions inventory that includes all emissions sectors in the State, it is appropriate for local jurisdictions to derive evidence-based local per capita goals based on local emissions sectors and population projections that are consistent with the framework used to develop the statewide per capita targets. The resulting GHG emissions trajectory should show a downward trend consistent with the statewide objectives"[8]

This guidance recommends use of an efficiency target approach to derive local GHG targets for 2030 and 2050 target years, and suggests that local governments that had been using a 2020 target and planning horizon should update to targets that are focused on the 2030 and 2050 State goals:

> "Numerous local governments in California have already adopted GHG emissions reduction goals for year 2020 consistent with AB 32. CARB advises that local governments also develop community-wide GHG emissions reduction goals necessary to reach 2030 and 2050 climate

[7] *Id. at 225-228 (EIR must compare the specific project's expected emissions to the existing physical environment in the project's vicinity – at a specific location - rather than a hypothetical business as usual (BAU) scenario based on statewide assumptions).*

[8] *California Air Resources Board. The 2017 Climate Change Scoping Plan, page 148. Available: https://www.arb.ca.gov/cc/scopingplan/revised2017spu.pdf. Accessed November 10, 2017.*

goals. Emissions inventories and reduction goals should be expressed in mass emissions, per capita emissions, and service population emissions."[9]

The 2017 Scoping Plan recommends use of efficiency metrics to develop GHG targets for 2030 and beyond, and refers to OPR's recommendation that local governments define mass and efficiency targets for the GHG reduction analyses. It also states that use of such targets as defined therein is consistent with the State's GHG goals, as well as the recently signed Under 2 MOU[10] international agreement and the Paris Agreement.[11]

Office of Planning and Research (OPR) General Plan Guidelines

OPR recently updated the General Plan Guidelines, including a chapter on climate change that describes target-setting considerations for local governments.[12] The Guidelines suggest that target setting should be context-specific and tailored to a community's unique characteristics, while generally relating to the State's GHG targets. The Guidelines refer readers to ARB's guidance for local action, and also recommend analyzing a community's mass emissions and emissions efficiency to support a fuller understanding of the issue. It is worth noting that OPR's guidance **does not** define required targets for local governments to include in their CAPs.

D. Climate Science-Driven Targets

The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) stipulates that targets adopted to reduce GHG emissions are "science-based" if they are consistent with the magnitude of emission reductions required to limit the increase of global temperatures to 2°C above pre-industrial temperatures. This translates to the need to reduce global emissions by at least 80% below 1990 baseline levels by 2050 (this is also California's 2050 statewide GHG target expressed in EO-S-3-05).

In late 2015, advisory bodies to the IPCC reported that limiting the average global temperature increase to 2°C may not be adequate, as a 2°C increase would still result in irreparable damage to ecosystems, food security, and sustainable development in the world's most vulnerable communities, particularly small island nations and low-lying plains. They proposed an aspirational target to limit the average global temperature increase to 1.5°C to avoid the most severe impacts to these geographies. This latest literature suggests the need for a more significant magnitude of GHG reductions by cities in the developed world. In order to achieve the targets in the Paris Agreement, global "net-zero" emissions much be reached to maintain global temperature rise below 1.5°C. The Paris Agreement (Article 3.1) states that "Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof." As developed nations have a greater capacity to achieve such reductions given access to resources and existing quality of life, there is much incentive for such nations to drive the net-zero emissions reduction model.

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[9] *California Air Resources Board. The 2017 Climate Change Scoping Plan, page 149. Available: https://www.arb.ca.gov/cc/scopingplan/revised2017spu.pdf. Accessed November 10, 2017.*

[10] *The Under 2 Memorandum of Understanding (MOU) is a subnational climate agreement developed by the Under2 Coalition to limit global temperature increases to less than 2°C through agreements from signatories to reduce their GHG emissions to 80-95% below 1990 levels by 2050 or limit to 2 MT CO_2e/capita per year by 2050. Available: http://under2mou.org/*

[11] *The Paris Agreement is an international agreement developed through the United Nations Framework Convention on Climate Change to keep global temperature rise this century below 2°C, and pursue efforts to limit temperature increases to 1.5°C. The Paris Agreement is based on nationally determined contributions to achieve its goal, which represent the ratifying parties best efforts toward addressing climate change. Available: http://unfccc.int/paris_agreement/items/9485.php*

[12] *The Governor's Office of Planning and Research. General Plan Guidelines, Chapter 8 Climate Change. Available: https://www.opr.ca.gov/docs/OPR_C8_final.pdf*

As the majority of GHG emissions generated in Long Beach result from transportation (54%) and building energy use (41%), it is important to address the connection between climate forcers such as CO_2 and CH_4 (methane) and criteria air pollutants such as NO_x and Volatile Organic Compounds (VOCs) when considering GHG reduction target-setting and climate science. Interactions between criteria pollutants and climate exist within the atmosphere which worsen the effects of greenhouse gases and contribute to increased background levels of criteria pollutants. An example from the South Coast Air Quality Management District 2016 Air Quality Management Plan describes the interaction of methane with criteria pollutants. As methane reacts with criteria air pollutants in the atmosphere, it begins to behave like a VOC and increases background tropospheric ozone levels, which in turn makes achievement of air quality standards more difficult. Further, according to the IPCC (AR5 2013) tropospheric ozone is also one of the most reactive and significant of the short-lived climate pollutants. This example illustrates the interconnection between GHG emissions and air quality, and indicates one of the myriad opportunities for co-benefits associated with climate action planning.[13]

E. City's Emissions Profile

As shown in Table 2 below, the City's 2015 total emissions were 3.36 million metric tons of CO_2e with the majority coming from transportation (54%) and building energy use (41%). The remaining 5% comes from solid waste and wastewater.

Table 2
City of Long Beach 2015 Greenhouse Gas Inventory

Sector	MT CO_2e/yr	%
Energy	**1,367,000**	**41%**
Residential	428,245	13%
Commercial	290,527	9%
Manufacturing/Construction	399,089	12%
Energy Industries	219,899	7%
Fugitive Emissions (oil/natural gas)	29,240	1%
Transportation	**1,812,031**	**54%**
On-road Transportation	1,213,601	36%
Railways	11,883	0%
Waterborne Navigation	384,862	11%
Aviation	186,738	6%
Off-road Transportation	14,947	0%
Waste	**176,851**	**5%**
Solid Waste	173,259	5%
Wastewater	3,592	0%
Total	**3,355,882**	**100%**

[13] *South Coast AQMP 2016 Chapter 10, pg 2*

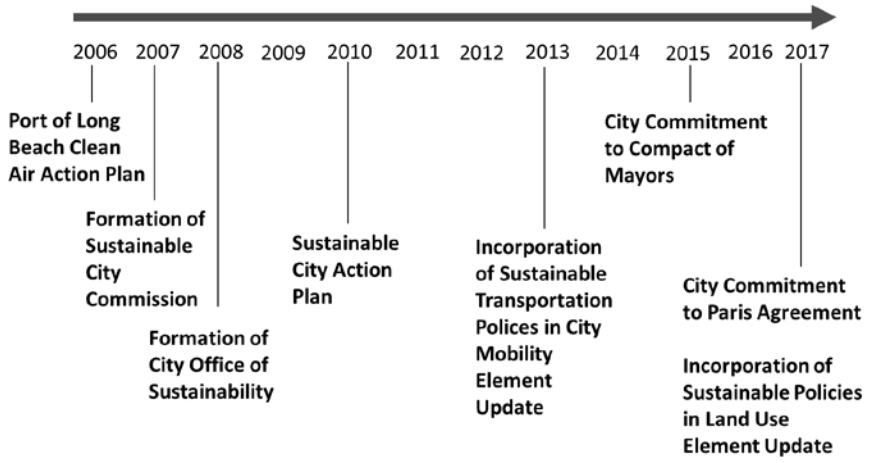
The source of emissions should be considered during target setting since the City has more influence over some sources than others. For example, local building codes can be designed to reduce energy emissions from residential and commercial buildings, or incentive programs could be designed to trade in less efficient personal vehicles for high-efficiency or alternative fuel vehicle options. In contrast, a local government might have limited ability to influence technologies or fuels used in the aviation sector. These considerations are especially important for cities considering a net-zero or carbon neutrality GHG target; emissions sources that cannot be reduced would need to be offset in other ways in order to demonstrate target achievement.

F. City's Aspirations and Commitments

The City's aspirations for climate action and its past and planned commitments for local action should also be considered when defining a local reduction target because they illustrate the local political will and policy framework that can enable continued action in the future. The City of Long Beach has been an early adopter of sustainability planning, including through the following examples of local action:

- 2006: City implements the Port of Long Beach Clean Air Action Plan
- 2007: Formation of the Long Beach Sustainable City Commission
- 2008: Formation of the City Office of Sustainability
- 2010: Development of the Sustainable City Action Plan
- 2013: Incorporation of Sustainable Transportation Policies into City of Long Beach Mobility Element Update
- 2015: Mayor Robert Garcia signs the Compact of Mayors (now the Global Covenant of Mayors) to join the world's largest coalition of city governments to address climate change[14]
- 2017: Mayor Garcia joins 406 mayors across the United States in pledging to continue the goals of the Paris Climate Agreement to make sustainable changes to limit global temperature rise to well below 2°C[15]; City begins development of the CAAP to define a pathway that help the City fulfill its climate commitments; Incorporation of Sustainable Policies in Land Use Element Update

Figure 2 – Timeline of Long Beach Sustainability Activities



[14] *City of Long Beach Press Release "What is Long Beach doing about Climate Change" (11/10/2015). (Accessed 07/02/2018). Available: http://www.longbeach.gov/mayor/news/compact/*

[15] *City of Long Beach Press Release "Long Beach Joins Paris Agreement" (06/02/2017). (Accessed 07/02/2018). Available: http://www.longbeach.gov/mayor/news/long-beach-joins-paris-agreement/*

The City has also enacted several local initiatives (or planning to support these local actions) that will result in GHG reductions and contribute to the GHG targets defined in the CAAP, including[16]:

- Electric car charger giveaways
- Green Port Policy of zero emission cargo-handling equipment by 2030 and zero emission trucks by 2035 (Clean Air Action Plan)[17]
- Planting 6,000 new trees by 2020
- Addition of 2 megawatts (MW) of solar power at city facilities by 2020
- Expansion of bicycle and pedestrian infrastructure
- Conversion of all street lighting to energy efficient LEDs
- All new City government and major private development buildings designed to LEED standards
- Over 5,000 water and energy saving Lawn-to-Garden transformations already completed
- Transit-oriented development to guarantee sustainable housing projects

G. Target Timeframes

Local GHG targets can be set to align with various objectives, such as State GHG goals, local funding cycles, or long-term planning horizons. From an implementation standpoint, most CAPs are designed with near-term (5-10 years), medium-term (10-20 years), and long-term (20+ year) targets to provide waypoints for progress tracking. With this approach, it is helpful to identify the final target (long-term target) up front, and then set a series of interim targets (near- and medium-term targets) that lead to it. This ensures that near-term targets are aggressive enough to make progress toward the long-term target, and supports strategic thinking on early-action items that will provide long-term benefits.

Alternatively, some cities have found success in focusing intently on near-term targets and actions that can be achieved in one political or funding cycle. For example, the city of Chicago sets 5-year targets in its Sustainability Plan, tracks and analyzes progress during that timeframe, and then sets new 5-year targets to incrementally push the city forward. Chicago does have an overarching long-term GHG target (80% below 1990 levels by 2050), but the connection between the 5-year targets and the 2050 target is not explicitly defined, such that achievement of the near-term targets does not necessarily indicate the city is on track to achieve its long-term target. It's important to note however that Chicago's context is different from that established in California through AB 32, SB 32, and Court rulings related to CEQA, and the State's legislative framework for GHG emissions impacts.

California's GHG target years are 2020, 2030, and 2050. Given the proximity to the State's 2020 target year, CAAP target years for 2030 and 2040 are tentatively proposed to allow the City time to establish and achieve the most meaningful GHG reduction targets. An aspirational 2050 target is also recommended to provide a long-term vision that underpins the nearer-term targets. The 2030 and 2050 years would link the City's targets directly to the State's GHG planning timeframe, while the 2040 target year aligns with the Long Beach General Plan horizon year, which can be beneficial when developing the CAAP's environmental review document for CEQA compliance.

[16] *City of Long Beach Press Release "Long Beach Joins Paris Agreement" (06/02/2017). (Accessed 07/02/2018). Available: http://www.longbeach.gov/mayor/news/long-beach-joins-paris-agreement/*

[17] *"LA and Long Beach mayors sign pact setting zero-emissions goals for ports" (06/12/2017). Los Angeles Times. (Accessed 07/02/2018). Available: http://www.latimes.com/local/california/la-me-ports-clean-air-20170612-story.html*

H. Other Local Government Targets

In addition to the guidance provided by State agencies, it can be helpful to consider the GHG targets of other local governments when defining a target because it reinforces the notion that cities are not acting alone, and therefore, are not putting themselves at a regional economic disadvantage through their climate change response. It is also important to consider the context of other cities' targets, including their baseline year, the types of reduction strategies included in their plans, and how they treat statewide actions, when referencing them as the basis for local target setting.

Table 3 shows different GHG targets from other local governments in the California.

Table 3
Other Local Government Greenhouse Gas Targets

City Name (CAP Year)	Target Type	Target Year				
		2020	2025	2030	2035	2050
City of LA (2017)	Mass emissions	Achieve 1990 levels	45% below 1990 levels	-	60% below 1990 levels	80% below 1990 levels[18]
County of LA (2015)	Mass emissions	11% below 2010 levels	-	-	-	-
City of Glendale (2012)	Mass Emissions	8% from 2005 levels	-	-	13% from 2005 levels	-
City of Santa Monica (2015)	Mass Emissions	20% below 1990 levels	-	30% below 1990 levels	-	80% below 1990 levels[19]
City of Pasadena (2018)	Mass Emissions	27% below 2009 levels (14% below 1990 levels)	-	49% below 2009 levels (40% below 1990 levels)	59% below 2009 levels (52% below 1990 levels)	83% below 2009 levels (80% below 1990 levels)
City of San Diego (2016)	Mass Emissions	15% below 2010 levels	-	40% below 2010 levels	50% below 2010 levels	-
City of Oakland (2018)	Mass Emissions	-	-	56% below 2005 levels	-	83% below 2005 levels
City of San Francisco (2013)	Mass emissions	-	-	40% below 1990 levels	-	80% below 1990 levels

As shown in the examples above, most of the communities established a mid-term target for 2030 or 2035, and five have set long-term targets which meet the statewide 2050 target. In addition, the Cities of Los Angeles and Santa Monica are considering carbon neutrality targets, though neither has formally adopted such targets yet. It is worth noting that none of the communities shown above have selected an efficiency-based target. This may be due to the fact that many of the reference CAPs were prepared prior to the 2017 Scoping Plan Update and OPR's General Plan Guidance, which both reference efficiency targets as acceptable options for local governments and recommend their use along with mass emissions

[18] *The City is currently evaluating GHG reduction pathways to achieve carbon neutrality by 2050*
[19] *The Mayor has stated the City's commitment to achieving carbon neutrality by 2050: https://www.santamonica.gov/blog/santa-monica-commits-to-uphold-paris-climate-agreement-goals*

targets to present a holistic understanding of emissions in the community. This does not suggest that Long Beach could not adopt an efficiency target, but it indicates that it might be useful to include mass emissions targets as well to better support comparisons with neighboring communities' commitments.

I. 2030 and 2040 Target Options for Long Beach

Table 4 on the following page presents several target options for the 2030 and 2040 planning years. At this time, we do not recommend including a 2020 target for analysis since the CAAP is a long-term planning document that will not be finalized until it is nearly 2020. In one instance, a 2020 target is included as a reference because the subsequent targets are based upon it.

Target Options A through E include a set of local targets derived from the State's GHG targets, which are aligned with the Paris Agreement 2°C goal as described in the preceding sections. Target Option F represents a net-zero emissions target more closely aligned with the Paris Agreement 1.5°C goal. The applicable considerations are provided for each option in order to describe whether the potential targets might be appropriate for use at the local level.

We preliminarily recommend the targets shown in Target Options B,D, and E for the City's CAAP because they align with the most current guidance from ARB, OPR, and indirectly with the California Supreme Court's Newhall Ranch decision[20]; are tailored to match the emissions sectors included locally in the City's inventory; and provide an easy calculation metric for tracking future target progress. Target Option B would result in absolute emissions reductions because it is framed as a mass emissions target, corresponds closely with the Paris Agreement's 2°C goal based on its relationship to California's 2050 GHG target, and would support CEQA streamlining benefits for new development. Target Options D and E could result in absolute emissions reductions or in scenarios with absolute emissions growth, but improved emissions efficiency (e.g., tons per capita); the implications of these target will depend on the City's emissions forecasts and demographic growth estimates, both of which are currently being collected and analyzed. These targets are also based on California's 2050 GHG target, and therefore correspond with the Paris Agreement's 2°C goal and would support CEQA streamlining benefits; however, an emissions target scenario that allows absolute emissions growth in the future could present challenges from a public perception standpoint.

Target Option F is also a good candidate if the City wishes to establish a 2050 carbon neutrality target aligning with the Paris Agreement's 1.5°C goal. The values shown in Option E represent a linear trajectory in emissions efficiency from 2015 levels to carbon neutrality by 2050, but other interim target values could be derived, including for example, more aggressive interim targets to reduce the cumulative emissions generated in the community by 2050. To provide CEQA streamlining benefits, the interim targets would need to be at least as aggressive as those defined in Target Option D.

[20] *The Newhall Ranch case was not about a communitywide climate action plan, but rather a new development project and that project's GHG threshold. This is an important distinction because communitywide CAPs consider emissions from existing and future development, whereas a project's CEQA analysis only considers emissions from new development associated with the project. However, the guidance provided in the Newhall Ranch case decision is still interpreted as a good analog for CAP target setting because it affirms the connection between State's GHG legislative framework, local agency determination, and CEQA determination.*

Table 4
2030 and 2040 Greenhouse Gas Target Options

Option	Target	Considerations	Recommendation
Target Option A – 2008 Scoping Plan Mass Emissions Target			
2030	40% below 2015 levels (2,013,529 MT CO_2e/yr)	Not appropriate use of State's 2030 target because it should be measured from 1990 inventory levels, and City's baseline inventory is 2015	**No**
2040	60% below 2015 levels (1,342,353 MT CO_2e/yr)	Not appropriate interpolation of State's 2030 and 2050 targets because they should be measured from 1990 inventory levels, and City's baseline inventory is 2015	**No**
Target Option B – 2015 Statewide Inventory Mass Emissions Target			
2020	2.2% below 2015 levels (3,282,053 MT CO_2e/yr)	Roughly approximates return to 1990 levels based on statewide inventories; implies that all state inventory sectors are included in local inventory, which is not true	**Maybe**
2030	40% below 2020 target level (1,969,232 MT CO_2e/yr)	Mirrors State targets, assuming 2020 target represents a return to 1990 levels These targets would align with the Paris Agreement 2°C goal through consistency with California's 2050 GHG target	**Maybe**
2040	60% below 2020 target level (1,312,821 MT CO_2e/yr)		**Maybe**
Target Option C – 2017 Scoping Plan Efficiency Targets			
2030	6.0 MT CO_2e/capita (2,882,544 MT CO_2e/yr)	Not an appropriate use of ARB guidance in Scoping Plan Update because targets assume all statewide inventory sectors are included in local inventory; City's inventory only includes a sub-set of statewide sectors	**No**
2040	4.0 MT CO_2e/capita (1,937,940 MT CO_2e/yr)		**No**

Table 4
2030 and 2040 Greenhouse Gas Target Options

Option	Target	Considerations	Recommendation
Target Option D – Local Emissions Source-Based Efficiency Targets			
2030	4.88 MT CO_2e/capita (2,344,469 MT CO_2e/yr); 3.35 MT CO_2e/SP (2,317,161 MT CO_2e/yr)	Calculates per capita and per service population emissions targets based on sub-set of statewide emissions sectors that will are included in City's inventory These targets would align with the Paris Agreement 2°C goal through consistency with California's 2050 GHG target	**Maybe**
2040	3.05 MT CO_2e/capita (1,477,679 MT CO_2e/yr); 2.10 MT CO_2e/SP (1,398,915 MT CO_2e/yr)		**Maybe**
Target Option E – Local Emissions (without Passenger Vehicles) Efficiency Targets			
2030	3.40 MT CO_2e/capita (1,633,442 MT CO_2e/yr); 2.33 MT CO_2e/SP (1,520,841 MT CO_2e/yr)	Calculates per capita and per service population emissions targets based on sub-set of statewide emissions sectors that will be included in City's inventory, excluding passenger cars and light duty trucks, which will be addressed at the regional level through SB 375 legislation[21] These targets would align with the Paris Agreement 2°C goal through consistency with California's 2050 GHG target *Note: This option proposes removing only the passenger vehicle emissions from consideration and not mobile emissions from other types of vehicles. This would remove only GHG emissions that are specifically addressed through the SB 375 process.*	**Maybe**
2040	2.13 MT CO_2e/capita (1,031,953 MT CO_2e/yr); 1.46 MT CO_2e/SP (972,579 MT CO_2e/yr)		**Maybe**

[21] *The Sustainable Communities and Climate Protection Act of 2008 (SB 375) directs the California Air Resources Board to set regional targets for GHG reductions from passenger vehicles. The targets are designed to align with the State's GHG reduction targets, and are implemented through a Regional Transportation Plan/Sustainable Communities Strategy prepared by California's metropolitan planning organizations, including the Southern California Association of Governments of which Long Beach is a member.*

Table 4 2030 and 2040 Greenhouse Gas Target Options			
Option	**Target**	**Considerations**	**Recommendation**
Target Option F – Net Carbon Neutrality Target			
2030	4.10 MT CO_2e/capita (1,969,738 MT CO_2e/yr); 3.07 MT CO_2e/SP (2,003,854 MT CO_2e/yr)	Aims for net-zero emissions by 2050, with interim targets defined based on linear trajectory from City's emissions efficiency levels in 2015 to net zero emissions in 2050. Interim efficiency levels could be revised further to achieve greater emissions reductions in earlier years, which would minimize total cumulative emissions over time. Achieving carbon neutrality would require GHG reductions in emissions sub-sectors over which the City does not exercise direct control (e.g., aviation, rail transport, oil/gas refining) and would be contingent upon partnerships with external agencies/organizations or investment in carbon offset programs. These targets would align with the Paris Agreement 1.5°C goal through consistency with a net carbon neutrality trajectory by 2050.	**Maybe**
2040	2.05 MT CO_2e/capita (993,194 MT CO_2e/yr); 1.54 MT CO_2e/SP (1,025,871 MT CO_2e/yr)		**Maybe**

J. 2050 GHG Aspirational Targets

The same target options described for 2030 and 2040 can be extended to 2050 as shown in Table 5. At this point, these options can be considered aspirational targets given the uncertainty around future technological, policy, or programmatic advancements that will influence the City's ability to achieve such targets.

Table 5 2050 Aspirational Greenhouse Gas Target Options			
Option	**Target**	**Considerations**	**Recommendation**
Target Option A – 2008 Scoping Plan Mass Emissions Target			
2050	80% below 2015 levels (671,176 MT CO_2e/yr)	Not appropriate use of State's 2050 target because it should be measured from 1990 inventory levels, and City's baseline inventory measures 2015 GHG levels	**No**
Target Option B – 2015 Statewide Inventory Mass Emissions Target			
2020	2.2% below 2015 levels (3,282,053 MT CO_2e/yr)	Roughly approximates return to 1990 levels based on statewide inventories; implies that all state inventory sectors are included in local inventory, which is not true	**Maybe**

Table 5
2050 Aspirational Greenhouse Gas Target Options

Option	Target	Considerations	Recommendation
2050	80% below 2020 target level (656,411 MT CO_2e/yr)	Mirrors State targets, assuming 2020 target represents a return to 1990 levels	Maybe
Target Option C – 2017 Scoping Plan Efficiency Targets			
2050	2.0 MT CO_2e/capita (975,109 MT CO_2e/yr)	Not an appropriate use of ARB guidance in Scoping Plan Update because targets assume all statewide inventory sectors are included in local inventory; City's inventory will only include a sub-set of statewide sectors	No
Target Option D – Local Emissions Source-Based Efficiency Targets			
2050	1.46 MT CO_2e/capita (711,830 MT CO_2e/yr); 1.00 MT CO_2e/SP (677,152 MT CO_2e/yr)	Calculates per capita and per service population emissions targets based on sub-set of statewide emissions sectors that will be included in City's inventory	Maybe
Target Option E – Local Emissions (without Passenger Vehicles) Efficiency Targets			
2050	1.01 MT CO_2e/capita (492,430 MT CO_2e/yr); 0.70 MT CO_2e/SP (474,006 MT CO_2e/yr)	Calculates per capita and per service population emissions targets based on sub-set of statewide emissions sectors that will be included in City's inventory, excluding passenger cars and light duty trucks, which will be addressed at regional level through SB 375 legislation These targets would align with the Paris Agreement 2°C goal through consistency with California's 2050 GHG target *Note: This option proposes removing only the passenger vehicle emissions from consideration and not mobile emissions from other types of vehicles. This would remove only GHG emissions that are specifically addressed through the SB 375 process.*	Maybe
Target Option F – Net Carbon Neutrality Target			
2050	Net-zero emissions (0 MT CO_2e/yr)	Aims for net-zero emissions by 2050. Achieving carbon neutrality would require GHG reductions in emissions sub-sectors over which the City does not exercise direct control (e.g., aviation, rail transport, oil/gas refining) and would be contingent upon partnerships with external agencies/organizations or investment in carbon offset programs.	Maybe

Figure 3 illustrates each of the target options when converted into mass emissions levels based on local resident and employment forecasts from the City's General Plan Land Use Element.

Figure 3 – Target Options in Mass Emissions

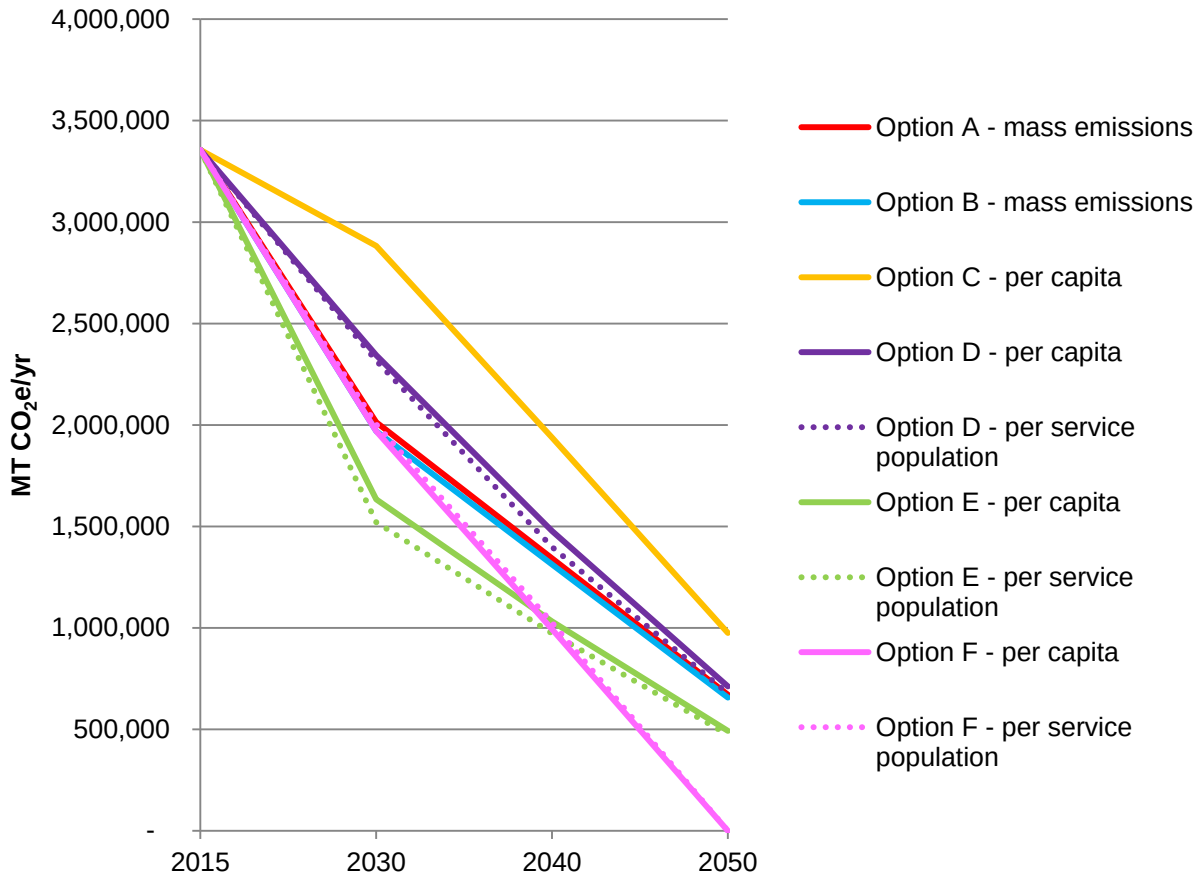
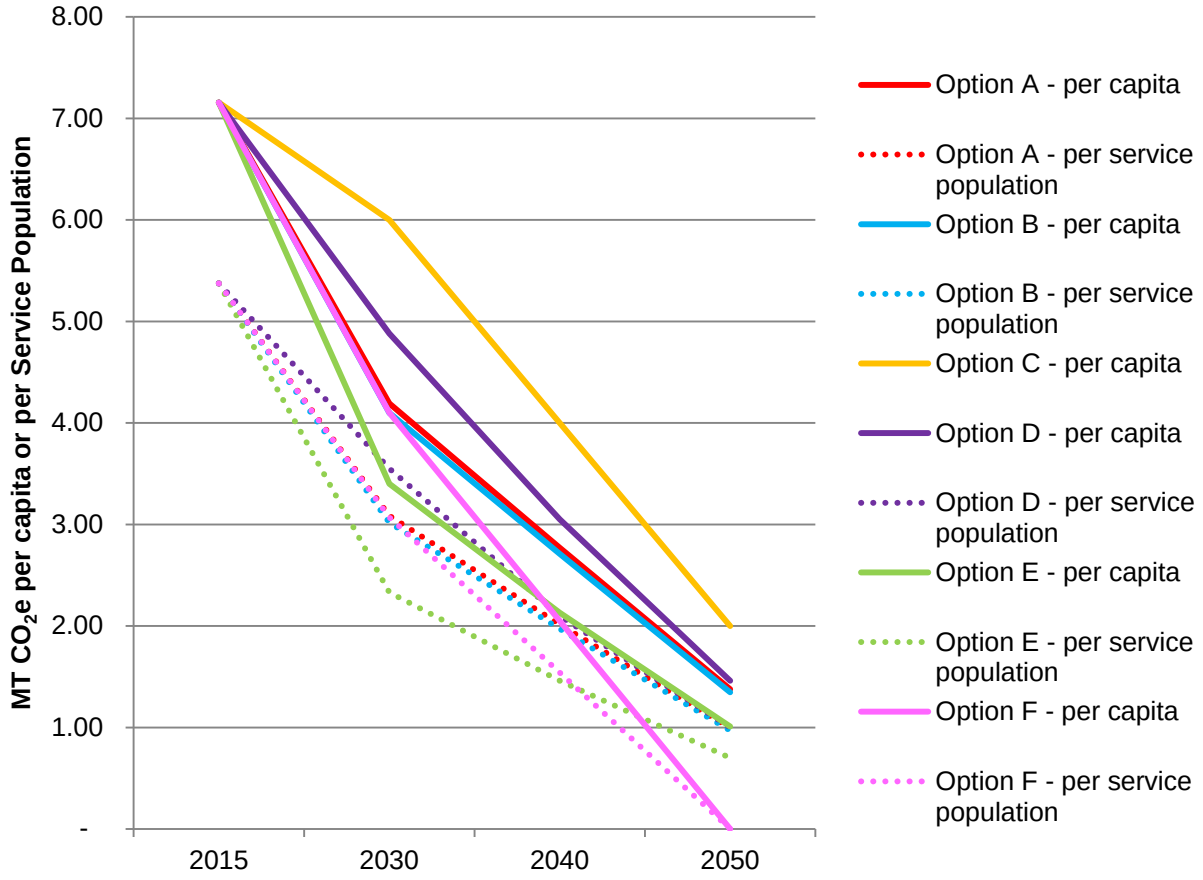


Figure 4 illustrates the target options as emissions efficiency levels. The solid lines show per capita emissions targets and the dotted lines show per service population versions of the targets.

Figure 4 – Target Options in Emissions Efficiency

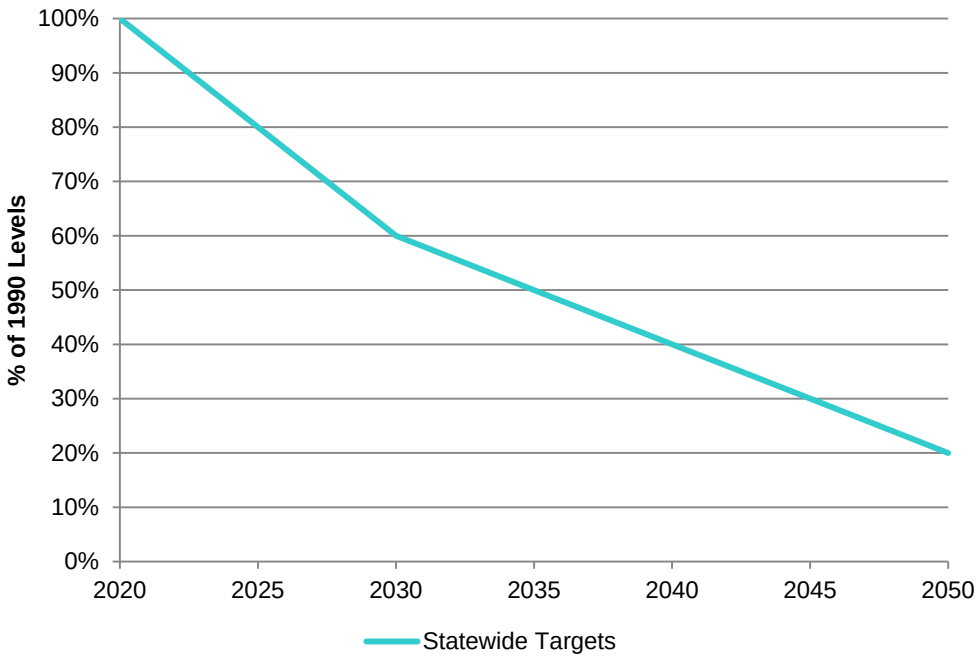


Section 2 – Target Calculation Methodology

A. Statewide Targets

In 2006, California took steps to develop a long-term response to the challenges of climate change through adoption of Assembly Bill 32 (AB 32). As the first-of-its-kind legislation in the country, AB 32 established a statewide GHG emissions reduction target to return to 1990 emissions levels by the year 2020. In addition to the near-term 2020 target codified in AB 32, Executive Order (EO) S-3-05 was signed by then-Governor Schwarzenegger in 2005 to establish a long-term emissions target of 80% below 1990 levels by 2050. Then, SB 32 was signed in 2016 to establish an interim target between the State's 2020 and 2050 targets, calling for reductions of 40% below 1990 levels by 2030. Figure 5 illustrates the trajectory of the State's targets from 2020 through 2050.

Figure 5 – Statewide Emissions Target Trajectory



Statewide Emissions Inventory

AB 32 (2006) required that the Air Resources Board (ARB) to determine the statewide greenhouse gas emissions level in 1990, from which progress toward achievement of the emissions targets shown in Figure 1 can be measured. AB 32 also required ARB to approve a statewide greenhouse gas emissions limit, equal to the 1990 level, as a limit to be achieved by 2020. In 2014, ARB adopted a revised 2020 emissions limit of 431 MMT CO_2e. This new emissions limit replaced the original 1990 limit approved in 2007. The currently approved 1990 limit (i.e., 431 MMT CO_2e) includes emissions from all sectors within the state. Table 6 shows the State's 2020, 2030 and 2050 emissions targets based on the approved 1990

limit. A 2040 target year value was interpolated between the 2030 and 2050 targets to correspond with the Long Beach General Plan horizon year.

Table 6
Statewide Emissions Inventory and Reduction Targets

	1990	2020	2030	2040	2050
Statewide Emissions Targets (MMT CO_2e)	431.0 [1]	431.0 [1]	258.6 [2]	n/a	86.2 [4]
Interpolated Mid-term Reduction Target	n/a	n/a	n/a	172.4 [3]	n/a
Amount below 1990 Levels	0%	0%	40%	60%	80%

Source: AECOM 2017

Note: MMT CO_2e = million metric tons of carbon dioxide equivalent

[1] California 1990 Greenhouse Gas Emissions Level and 2020 Limit, ARB: <http://www.arb.ca.gov/cc/inventory/1990level/1990level.htm>

[2] 40% below 1990 levels per SB 32

[3] Interpolated between 2030 and 2050 targets

[4] 80% below 1990 levels per EO-S-3-05

Local Application of Statewide Emissions Targets

Local governments in California often select the same emissions targets as the State when preparing GHG analyses. However, community GHG inventories often do not include all of the same emissions sectors as the statewide inventory. For example, community inventories may not include agricultural or forestry emissions. Therefore, a scaled version of the full statewide emissions inventory was developed as part of the City's CAAP analysis, which is based on the emissions inventory sectors occurring in Long Beach. The revised inventory is more appropriate for use in community CAAP target-setting because it draws a clearer correlation between the City's GHG target and its relationship to the State's own targets.

Table 7 on the following page presents a revised version of the 1990 statewide emissions shown in Table 6 and includes only the sectors and sub sectors included in the Long Beach communitywide inventory.

Table 7 Adjusted Statewide Emissions Inventory – Local Emissions Sources			
Main Sector / Sub Sector Level 1	**Total Emissions (MMT CO_2e/yr)** [1]	**Adjusted Emissions – Local Sources (MMT CO_2e/yr)**	**Notes/Adjustments**
Agriculture & Forestry	18.9	4.5	Includes only Ag Energy Use subsector
Commercial	14.4	13.9	Excludes National Security emissions from Sub Sector Level 1
Electricity Generation (Imports)	61.5	61.5	Includes all emissions
Electricity Generation (In State)	49.0	34.4	Excludes CHP: Industrial from Sub Sector Level 1
Industrial	105.3	61.4	Industrial emissions included, except as described in sub sectors below:
CHP: Industrial	*9.7*	*0.0*	*Excluded*
Flaring	*0.2*	*0.2*	
Landfills	*7.4*	*7.4*	
Manufacturing	*32.1*	*0.7*	*Includes only Construction emissions from Sub Sector Level 2*
Mining	*0.03*	*0.0*	*Excluded*
Not Specified	*2.7*	*0.0*	*Excluded*
Oil & Gas Extraction	*14.8*	*14.8*	
Petroleum Marketing	*0.02*	*0.0*	*Excluded*
Petroleum Refining	*32.8*	*32.8*	
Pipelines	*1.9*	*1.9*	
Waste Water Treatment	*3.6*	*3.6*	
Not Specified	1.3	1.3	Includes all emissions
Residential	29.7	29.7	Includes all emissions
Transportation	150.6	150.6	Includes all emissions
Total	**431.0**	**357.3**	

Notes: Sectors/sub-sectors may not sum exactly due to rounding

[1] California 1990 Greenhouse Gas Emissions Level and 2020 Limit by Sector, ARB: <http://www.arb.ca.gov/cc/inventory/1990level/1990level.htm>

Table 8 on the following page presents the adjusted statewide emissions based on the local emissions sources occurring in the Long Beach community inventory, with the corresponding statewide emissions targets for the 2020, 2030, 2040 and 2050 target years.

Table 8
Adjusted Statewide Emissions Inventory, Forecasts, and Reduction Targets – Local Emissions Sources

	1990	2020	2030	2040	2050
Statewide Emissions Targets (MMT CO_2e)	357.3 [1]	357.3 [1]	214.38 [2]	142.92 [3]	71.46 [4]
Amount below 1990 Levels	0%	0%	40%	60%	80%

Source: AECOM 2018

Note: MMT CO_2e = million metric tons of carbon dioxide equivalent

[1] See Table 7 for statewide inventory source and local emissions source adjustments.

[2] 40% below 1990 levels (i.e., 2020 target levels) per SB 32

[3] Interpolated between 2030 and 2050 targets

[4] 80% below 1990 levels (i.e., 2020 target levels) per EO-S-3-05

B. Efficiency Targets

Statewide emissions reduction targets can be normalized and expressed on a per-capita or per-service population basis to represent the rate of emissions needed statewide to achieve the AB 32 and SB 32 targets. This approach is often called an “efficiency” target. For example, to create an efficiency target that represents AB 32, one would divide the statewide emissions target for 2020 (shown in Table 7) by the statewide population and employment forecasts for 2020. This would yield an emissions “budget” for each California resident and employee and demonstrate that emissions levels in a community are the same as what would be required statewide to achieve the AB 32 GHG reduction target. As noted previously, ARB’s Proposed Scoping Plan recommends an efficiency target approach for local governments for 2030 and 2050 target years.

Table 9 presents statewide population and employment forecasts through 2050. The year 2024 is presented in this table because updated employment forecasts are available from the State Employment Development Department for this year.

Table 9
Statewide Demographic Projections

	2015	2020	2024	2030	2040	2050
Population	39,059,415 [1]	40,639,392 [1]	41,994,283 [1]	43,939,250 [1]	46,804,202 [1]	49,077,801 [1]
Employment	17,393,550 [2]	18,686,300 [2]	19,720,500 [3]	20,651,448 [4]	21,997,975 [4]	23,066,566 [4]
Service Population (population + employment)	56,452,965	59,325,692	61,714,783	64,590,698	68,802,177	72,144,367

Source: AECOM 2018

[1] DOF Table P-1 Total Estimated and Projected Population for California and Counties: July 1, 2010 to July 1, 2060 in 1-year increments. January 2018. Available online at: <http://www.dof.ca.gov/Forecasting/Demographics/projections/>

[2] Interpolated from Employee Development Department (EDD) Employment Projections for 2014 (17,135,000) and 2024 (19,720,500). See Note 3 for employment estimation source.

[3] Employee Development Department (EDD) Employment Projections. Available online at: <http://www.labormarketinfo.edd.ca.gov/data/employment-projections.html>

[4] EDD does not provide employment estimates to 2050, so the ratio of employment to population estimated in 2024 (i.e., 47.0%) was applied to the DOF population estimates for 2030, 2040, and 2050.

Efficiency Targets – Total Statewide Inventory

Using the demographic forecasts from Table 9 and the statewide GHG targets from Table 6, statewide emissions efficiency targets can be developed for the 2020, 2030, 2040, and 2050 target years, which are presented in Table 10. The 2015 baseline emissions efficiency levels are also shown.

Table 10
Statewide Efficiency Baseline and Targets

	2015	2020	2030	2040	2050
Emissions Targets (MT CO_2e/yr) [1]	441,400,000 [3]	431,000,000	258,600,000	172,400,000	86,200,000
Population [2]	39,059,415	40,639,392	43,939,250	46,804,202	49,077,801
Service Population (SP) [2] (population + employment)	56,452,965	59,325,692	64,590,698	68,802,177	72,144,367
Per Capita Emissions Efficiency Targets (MT CO_2e/capita/yr)	**11.30**	**10.61**	**5.89**	**3.68**	**1.76**
Per Service Population Emissions Efficiency Targets (MT CO_2e/SP/yr)	**7.82**	**7.26**	**4.00**	**2.51**	**1.19**

Source: AECOM 2018

Note: MT CO_2e = metric tons of carbon dioxide equivalent; Service Population (SP) = population + employment

[1] See Table 6 for sources.

[2] See Table 9 for sources.

[3] California Air Resources Board, statewide 2015 inventory. Available online at: <https://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_sector_sum_2000-16.pdf>

Efficiency Targets – Local Emissions Sources

Local efficiency targets can be based upon the adjusted statewide emissions inventory to reflect local emissions sources. The calculation of local efficiency targets needs to incorporate the employment projections associated with the emissions activities for which emissions are being considered. Table 11 presents the revised statewide demographic projections reflecting only those employment sectors included in the local emissions sources from Table 7.

Table 11
Statewide Demographic Projections – Local Emissions Sources Employment

	2020	2024	2030	2040	2050
Population	40,639,392 [1]	41,994,283 [1]	43,939,250 [1]	46,804,202 [1]	49,077,801 [1]
Employment	18,185,480 [2]	19,194,800 [3]	20,083,808 [4]	21,393,324 [4]	22,432,543 [4]
Service Population (population + employment)	58,824,872	61,189,083	64,023,058	68,197,526	71,510,344

Source: AECOM 2018

[1] DOF Table P-1 Total Estimated and Projected Population for California and Counties: July 1, 2010 to July 1, 2060 in 1-year increments. January 2018. Available online at: <http://www.dof.ca.gov/Forecasting/Demographics/projections/>

[2] Interpolated from revised (i.e., local emissions sources) Employee Development Department (EDD) Employment Projections for 2014 (16,671,500) and 2024 (19,194,800). See Note 3 for employment estimation source.

[3] Employee Development Department (EDD) Employment Projections. Available online at: <http://www.labormarketinfo.edd.ca.gov/data/employment-projections.html>. Sorted to remove jobs from: 11-9013 Farmers, Ranchers, and Other Agricultural Managers; 19-1032 Foresters; 19-4093 Forest and Conservation

Technicians; 45-000 Farming, Fishing, and Forestry Occupations; 47-5021 Earth Drillers, Except Oil and Gas; 49-3041 Farm Equipment Mechanics and Service Technicians.

[4] EDD provides 2- and 10-year employment estimates that currently extend to 2024, so the ratio of employment to population estimated in 2024 (i.e., 45.7%) was applied to the DOF population estimates for 2030, 2040, and 2050 to estimate employment in those years.

Based on the adjusted statewide demographic projections shown above, Table 12 shows the efficiency targets most applicable for use in Long Beach's CAAP given the emissions sources included in its communitywide inventory.

Table 12
Local Efficiency Targets

	2020	2030	2040	2050
Emissions Targets (MT CO_2e/yr) [1]	357,300,000	214,380,000	142,920,000	71,460,000
Percent Mass Emissions Reduction	n/a	40% below 1990	60% below 1990	80% below 1990
Population [2]	40,639,392	43,939,250	46,804,202	49,077,801
Service Population (SP) [2]	58,824,872	64,023,058	68,197,526	71,510,344
Per Capita Emissions Efficiency Targets (MT CO_2e/capita/yr)	**8.79**	**4.88**	**3.05**	**1.46**
Per Service Population Emissions Efficiency Targets (MT CO_2e/SP/yr)	**6.07**	**3.35**	**2.10**	**1.00**

Source: AECOM 2018

Note: MT CO_2e = metric tons of carbon dioxide equivalent; Service Population (SP) = population + employment

[1] See Table 8 for sources

[2] See Table 11 for sources.